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BY THE U.S. GENERAL ACCOUNTING OFFICE

**Report To The Administrator,  
Environmental Protection Agency**

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**San Francisco's Wastewater Treatment  
Program Needs Reexamination And  
Better Management**

When the initial phase of San Francisco's \$3 billion Wastewater Treatment Program becomes operational, it should significantly reduce the pollution of the San Francisco Bay and the Pacific Ocean. However, increased benefits to be gained by spending an additional \$2 billion to complete the remaining portions of the program may not be realized. Further, better management is needed by the state board over design and change order reviews. The significant reduction that has occurred in project funding levels intensifies the need for the Environmental Protection Agency to assure that its management delegation agreements require maximum benefits for federal monies expended.

GAO recommends that the Administrator of the Environmental Protection Agency suggest that San Francisco reexamine certain aspects of the program and modify it to achieve water quality objectives in a more cost-effective manner. GAO also recommends that EPA modify its agreements with the California Water Resources Control Board to improve its review of design elements.



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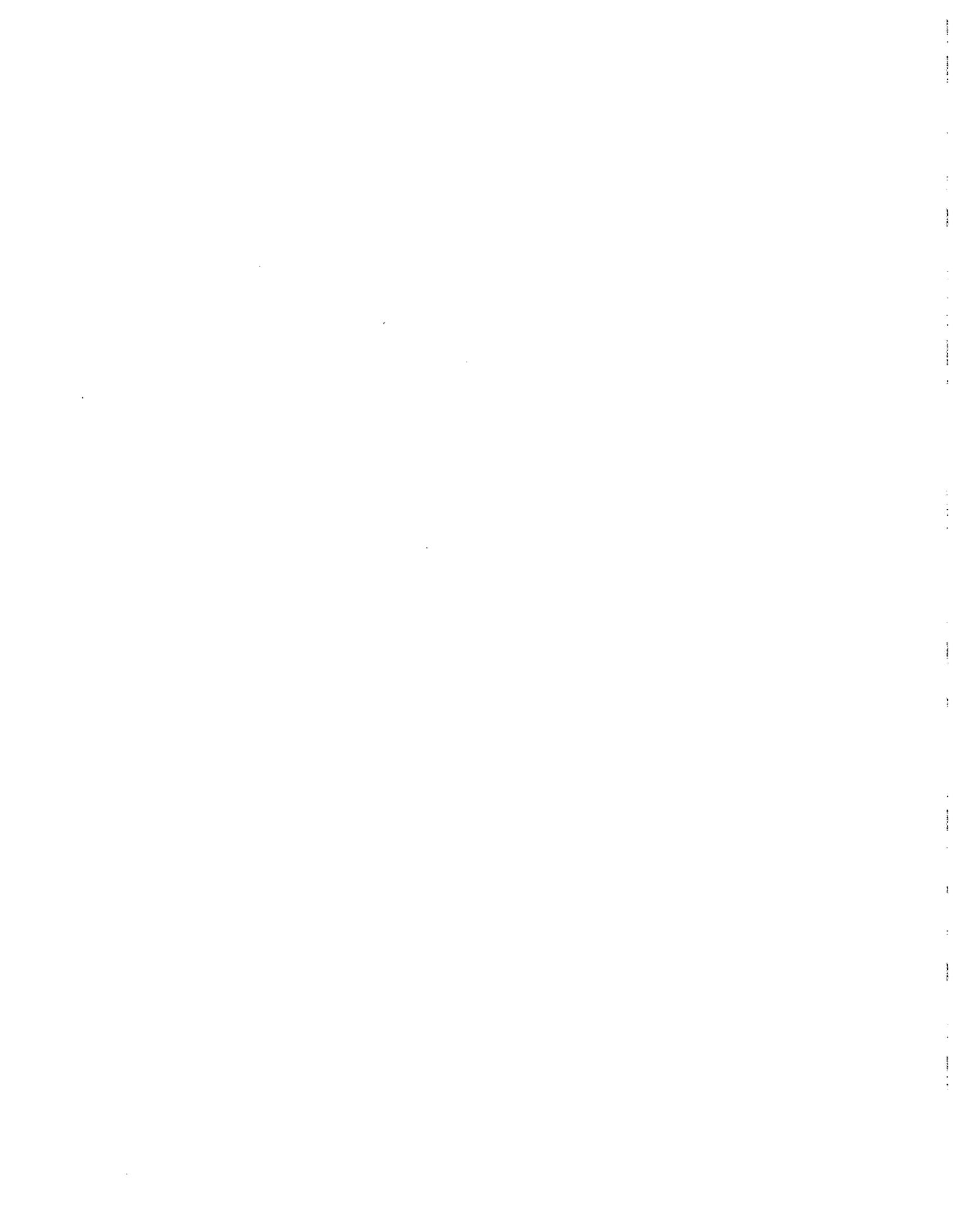
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UNITED STATES GENERAL ACCOUNTING OFFICE  
WASHINGTON, D.C. 20548

MISSION ANALYSIS AND  
SYSTEMS ACQUISITION DIVISION

B-205654

The Honorable Anne M. Gorsuch  
Environmental Protection Agency

Dear Ms. Gorsuch:

We reviewed the effectiveness of construction planning and management of San Francisco's Wastewater Treatment Program which is intended to reduce pollution of the San Francisco Bay and Pacific Ocean. The Environmental Protection Agency (EPA) approved a Master Plan in 1974 and through a series of agreements delegated project funding, management decisions and administrative authority to California's State Water Resources Control Board. However, EPA retains the responsibility for determining that the exercise of delegated authority under these agreements complies with appropriate laws and regulations and that maximum benefits are obtained for federal monies expended. The total estimated acquisition cost to construct the program is almost \$3 billion.

We believe the program should be reexamined to determine whether water quality objectives can be achieved in a more cost-effective manner. We also believe that better management is needed by the state board over certain program activities. Specifically, we found that

- reduced federal funding and uncertain state and city funding raise serious questions over completion of the program in the foreseeable future;
- once systems under construction are complete and operational, other elements of the program, estimated to cost about \$2 billion, will need to be built to attain limited, but uncertain, additional water quality benefits; and
- project design and change order reviews have been limited because of reduced resources.

Accordingly, we recommend that you suggest to the state board that it fund limited additional work until the initial systems under construction are completed and until the city analyzes the cost and benefits of these systems. The limited work should focus on the remaining areas with very serious water quality problems.

To improve surveillance and control over project design and change orders, we recommend that you amend (1) the EPA/state agreement to require the California State Water Resources Control Board to make periodic reviews of detailed project design elements and (2) the EPA/Corps agreement to require the Corps of Engineers to promptly disclose to the city deficiencies it identifies during inspections.

EPA officials share our concern of achieving water quality objectives in a cost-effective manner. They said that the program will be reexamined following completion of the two-core system, as we now recommend. They also said that although funding has been curtailed, no need exists to limit further funding for the basic project under construction.

The State Water Resources Control Board believes its level of involvement in San Francisco's Wastewater Program is appropriate and that the grantee is primarily responsible for the program. The board supports making analyses of alternatives to determine the validity of the Master Plan as the most cost-effective means of meeting the state/federal discharge requirements. The board agreed that certain factors, including funding availability, may, however, delay full implementation of the Master Plan. The board believed that it should not expand its role of design review since it would duplicate the project engineer's efforts and assume liability for design elements. A board official stated that sufficient resources are not available to make detailed reviews of all change orders or detailed procurement reviews.

California's Regional Board agreed with the need for reevaluation of certain remaining Master Plan projects. But it believed funding should not be stopped and certain projects should be built without further study (1) to enable the core system to operate and (2) to correct existing serious water quality problems. We agree with this approach.

The city's Chief Administrative Officer stated that San Francisco has made and will continue to make cost-effective program design changes to realize cost savings of up to \$1.1 billion. The officer also stated that elements of the Master Plan are being continually evaluated. The officer believes that when the two-core system is completed, over 90 percent of the city's wastewater will be intercepted and treated, but stated the city still needs facilities for proper treatment and discharge of wet weather sewage.

Details of our findings, conclusions, recommendations, and agency comments are contained in appendix I.

As you know, 31 U.S.C. 720 requires the head of a federal agency to submit a written statement on actions taken on our recommendations to the Senate Committee on Governmental Affairs

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and the House Committee on Government Operations not later than 60 days after the date of the report and to the House and Senate Committees on Appropriations with the agency's first request for appropriations made more than 60 days after the date of the report.

We are sending copies of this report to the cognizant House and Senate Legislative and Appropriation Committees; the Director, Office of Management and Budget; Chairwoman, State of California Water Resources Control Board; the Executive Officer, California Regional Water Quality Control Board; the city of San Francisco's Chief Administrative Officer; and the Secretaries of Defense and the Army.

Sincerely yours,

A handwritten signature in cursive script, appearing to read "W. H. Sheley, Jr.", written in dark ink.

W. H. Sheley, Jr.  
Director



SAN FRANCISCO'S  
WASTEWATER TREATMENT PROGRAM NEEDS  
REEXAMINATION AND BETTER MANAGEMENT

OBJECTIVES, SCOPE, AND METHODOLOGY

Our examination of San Francisco's Wastewater Treatment Program addressed (1) whether the program adopted by San Francisco was the most cost-effective solution for its water pollution problems, (2) how well certain aspects of the acquisition was managed, and (3) the cost and schedule status of the program.

We examined cost and the funding status of the program. We also reviewed consultant studies to ascertain their expert opinions on the benefits of the program. In addition, we reviewed the contracting and construction activities and the water quality benefits.

We visited the project office and construction sites and held discussions with the San Francisco Clean Water Program Director and staff; the State Water Resources Control Board Director and staff; the Regional Water Quality Control Board staff; and with EPA Headquarters and regional officials. We also spoke with Corps of Engineers (Corps) officials; EPA officials within the Office of the Inspector General; concerned citizens; and representatives of consulting firms that helped plan, design, and manage the program.

We examined the city's planning, review, and program status reports; cost estimates; policies and procedures for consultant selection; and the award of construction change orders. We examined state board procedures for assuring that consultants were selected according to regulations; and reviewed project design and cost estimates. We reviewed the Corps' procedures for ensuring (1) the adequacy of construction inspection and (2) the reimbursement eligibility of construction change orders. We also reviewed EPA construction grants program regulations and policies and regional board discharge permits and related records.

Our review was performed in accordance with generally accepted government auditing standards.

DESCRIPTION AND STATUS OF PROJECT

The city and county of San Francisco is designing and constructing a series of wastewater treatment projects to reduce pollution of San Francisco Bay and the Pacific Ocean and to comply with federal and state water quality requirements. Construction of these projects is collectively known as the city's Master Plan.

The current approved plan (see app. II) consists of:  
(1) underground tunnels (transports) around the city's perimeter

to store and convey sewage and stormwater runoff, (2) wastewater treatment plant projects to expand capacity and upgrade treatment quality, (3) a 6-mile crosstown tunnel to store and convey wastewater from the bayside to the oceanside of the city, and (4) an ocean outfall 1/ to convey San Francisco's treated sewage 4-1/2 miles into the Pacific Ocean. The design also provides for adding secondary waste treatment facilities (biological processes) to accelerate the decomposition of sewage.

The facilities described in the Master Plan are being constructed in stages. San Francisco has two "core systems" (inter-connected tunnels, pump stations, and wastewater treatment plants) under construction which can be used independently. During dry weather the system would provide secondary treatment to wastewater on the east side (bay) of the city and primary treatment to wastewater on the west side (ocean) and discharge it into the bay and the ocean, respectively. The core systems will also be capable of handling a large portion of wet weather flows.

Construction of the bayside projects began in 1977 and operation began in December 1982. The oceanside projects (storage/transport system and outfall) were planned for completion in February 1985, but cannot be operated until completion of a west side pump station in January 1986. Because of limited funding, system operation was extended to this date.

Costs for both the completed bayside project and the oceanside project under construction are estimated at \$780 million. Future proposed projects are estimated at \$518 million. The Master Plan also includes other projects which would increase costs to \$3 billion. However, an EPA official told us that these costs may be reduced if project evaluations reveal less costly alternatives. As of mid-July 1982, about \$676 million had been spent or contractually committed for the design and construction of Master Plan facilities.

#### How funding is provided

EPA, under the Federal Water Pollution Control Act Amendments of 1972 (Public Law 92-500) and through its construction grants program, funds 75 percent of eligible project costs. EPA annually allocates funds to each state, based on a specified formula. The state of California funds 12 1/2 percent and the city and county of San Francisco funds the remaining costs. The Municipal Wastewater Treatment Construction Grant Amendments of 1981 (Public Law 97-117) reduced the federal share of funding to 55 percent of

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1/ Precast concrete pipe sections, 12 feet in diameter, constructed from the Southwest Treatment Plant site out along the ocean floor.

eligible construction costs beginning in fiscal year 1985, except for certain waste treatment facilities which have received grants before October 1, 1984. Some additional funding may be available under section 5 of that act which authorizes a total of \$200 million per fiscal year to address water quality problems of marine bays and estuaries.

#### Roles of federal, state, and local agencies

EPA approved the Master Plan in 1974. Shortly thereafter, EPA's regional office, under a series of agreements, delegated project funding, management decisions, and administrative authority to California's State Water Resources Control Board. The EPA regional office prepared the Environmental Impact Statements. This office monitors the state's performance to ensure compliance with federal laws, regulations, and program requirements, and determines whether the California State Water Resources Control Board (state board) has effective management systems. If a disagreement occurs over the program, EPA can review appeals of another party and make suggestions to change the board's position or override its decision.

The state board reviews planning and construction grant applications, facilities plans, project designs, and the city contract bid and award process. It decides and places priorities on which projects to fund and monitors California's Construction Grants Program for EPA. Recommendations, determinations, and actions of the state board are subject to appeal by the city to the EPA regional administrator. The state board is also required to make a final project inspection upon completion of construction and start-up to ensure that the facilities are operating as planned. It also makes operation and maintenance inspections.

The city and county of San Francisco (grantee) proposes and designs projects, manages them, contracts for construction, and reviews construction. Once the projects are built, the city must also provide funds to operate and maintain them without further federal or state support.

The Corps reviews the suitability of project plans and specifications for bidding and construction purposes. It is responsible for overseeing the city's construction management and ascertaining that the city is making adequate reviews of construction. The Corps also determines if change orders are eligible for payment under the terms of the grant. These functions were transferred from the state board to the Corps in 1980.

The Bay Area Regional Water Quality Control Board (regional board), one of nine regions under the jurisdiction of the state board, establishes the water quality objectives for the San Francisco area. After coordinating with the state board and EPA, it establishes wastewater discharge requirements and water quality

standards. The regional board issues wastewater discharge permits according to the federal National Pollutant Discharge Elimination System Permit Program delegated to the state by EPA. These permits establish discharge limitations for specific pollutants or substances and other conditions which, if violated, can result in sewer connection bans, fines, and court ordered compliance schedules against the discharger.

The Regional Board's Basin Plan stated a preference for ocean discharge of San Francisco's treated wastewater rather than a bay discharge, because an ocean discharge would permit better protection of water quality. Also, the board's analyses showed that an ocean discharge was more cost effective. Accordingly, the regional board established water quality objectives by adopting the Basin Plan for the San Francisco Bay region. This plan was also approved by both the state board and EPA.

#### NEED TO REEXAMINE SAN FRANCISCO'S WASTEWATER TREATMENT PROGRAM

Reduced federal funding has caused uncertainty over the availability of sufficient future financing of San Francisco's Wastewater Treatment Program as required by its Master Plan. Some Master Plan projects have been delayed, indefinitely deferred, or may never be built if future planned funding is not available. This will result in either delays in attaining water quality objectives or in reduced benefits.

Construction of the remainder of San Francisco's Wastewater Treatment Program, after the initially planned core systems are built, may not justify additional planned expenditures of up to \$2 billion. Certain consultants and EPA's Deputy Assistant Administrator have been concerned about the program's cost effectiveness and its effect on bay and ocean water quality. We were told by city officials that additional analyses will be done after the core projects are completed and before additional projects are funded. State board officials support continued reviews of project cost effectiveness, but believe that any alternative must provide the same water quality benefits established by the current Master Plan.

#### Reduced future funding

State and city officials are uncertain over the level of federal funding to construct the remaining \$2 billion in projects after the core system projects are completed. The Municipal Wastewater Treatment Construction Grant Amendments of 1981 authorized \$2.4 billion a year for the Construction Grants Programs nationwide for fiscal years 1982 through 1985. This funding is significantly less than the \$5 billion appropriation level

previously anticipated by the state board and the city. In addition, federal participation is to be reduced from 75 to 55 percent beginning in fiscal year 1985. This reduction will place a greater burden on local and/or state governments. But some funding could be made available to the city under section 5 of the Clean Water Act which provides up to a total of \$200 million per fiscal year for jurisdictions with combined sewer systems that discharge into bays and estuaries.

City funding of future projects is also uncertain. The city pays its share of program costs from the sale of bonds authorized by its residents. Approximately \$300 million in authorized bonding capability is available to support the city's share of the program. However, the city's Chief Administrative Officer believes that voter approval of additional bonds is unlikely.

City officials recognized the need for additional funds to complete Master Plan projects and comply with the regional board's water quality standards. City officials said they have sufficient funds to pay for their share currently estimated at \$1.3 billion, scaled back from \$2.4 billion if the federal and state government contribution rates remain unchanged. But based on the state's program cost estimate of almost \$3 billion, the city would be responsible for at least 12.5 percent of the additional \$1.4 billion needed to complete the program. The city will also have to fund a significantly higher percentage of project costs beginning in fiscal year 1985 when federal participation is reduced to 55 percent, assuming the state does not increase its participation rate.

#### Water quality goals may not be met with reduced funding

Reduced funding will impede the attainment of water quality goals and reduced discharge requirements, since sufficient funding will not be available to build planned projects. For example, the bayside core system should reduce the frequency of combined sewer overflows in the north part of the bay. But the state board project officer said that some overflows into the southern part of the bay would still occur unless additional funds are available for building projects according to the Master Plan.

In the final phases of constructing Master Plan facilities, a crosstown tunnel and a wastewater treatment plant is planned to be modified or expanded to provide the system with treatment capability to meet all bayside water quality objectives for wet weather flows. The state board project officer estimated this construction also would be delayed several years because of funding limitations.

The oceanside core system is designed to discharge wastewater more than 4 miles into the Pacific Ocean, instead of near the

northern tip of the city, as is now done. This system would reduce average annual overflows in San Francisco's central coastline area, where water contact occurs most often. However, only limited overflow reductions will occur in the city's north coastline area and none will occur in the south unless sufficient funding is available to construct planned projects. Thus, water quality goals will not be met in certain areas as established by construction schedules and priorities.

An EPA official stated that construction of the entire system is neither feasible nor desirable and some sewer overflows will continue to occur in certain parts of the city. He believed that the progress to date will result in noticeable water quality improvements to the bay and to ocean beaches. He thought that operating data on the treatment capabilities of the storage/transport system under construction will be useful in designing and constructing the remaining facilities and that cost savings may result.

Potential alternatives to the crosstown tunnel and outfall use are being considered

In 1975, early in the planning process for San Francisco's Wastewater Treatment Program, EPA's Deputy Assistant Administrator for Water Program Operations commented on the cost effectiveness of the crosstown tunnel.

"Because of the high and very uncertain cost, the crosstown tunnel does not appear cost effective and should be abandoned now unless overriding considerations to the contrary have been overlooked in the San Francisco plan. This would allow reductions in the size and cost of the first stage ocean outfall and preclude possible future Federal grant assistance for the crosstown tunnel and for treatment of Bayside wet-weather flows at the proposed Southwest plant."

Currently, construction of the crosstown transport, which was initially to be a deep tunnel, has been deferred because of limited funding. But the crosstown facility remains in the Master Plan because, according to an EPA official, it or a similar structure is still a viable system component. The EPA official stated that preliminary cost analyses indicate that a crosstown facility may remain the most cost-effective alternative for meeting discharge requirements. The official said a more thorough analysis of the tunnel and its alternatives will be made before the facility is funded. The official also said that the existing southeast facility does not have sufficient outfall capacity for proper bay disposal; and therefore, a comparative study should be made of bay disposal compared to ocean disposal using a crosstown facility.

City officials told us that they are considering construction of a near-surface crosstown pressurized pipe instead of the planned deep tunnel. They believe that construction of the pipe would significantly reduce the cost of the program.

An ocean outfall, estimated to cost about \$166 million, is being built and is scheduled to be completed in February 1985. It is sized to handle wet weather flows from both sides of the city. The outfall is part of the oceanside core system, but without connecting it to a crosstown tunnel, and using it with the initial core systems, only about 5 percent of its capacity would be needed during dry weather flows and only about 29 percent of its capacity would be used in wet weather.

An EPA official agreed that the outfall would be underutilized for some time, but said that downsizing the outfall would cost more than continuing its construction. A state board official stated that when fully operational, only 18 percent of the outfall capacity would be used for dry weather flows, while 100 percent of the capacity is necessary for wet weather flows. According to the state board official, downsizing would preclude options the city wishes to keep open and which the state and EPA concur in.

Water quality benefits are  
not clearly defined

Improvements in water quality expected to result from the completed projects in San Francisco's Master Plan are not clearly identified. A significant reduction in the number of overflows from the wastewater system is expected to result in a lessening of potentially harmful levels of bacteria which could be detrimental to those who come in contact with the water. But, the city reports that overflows contribute less than 1 percent to total pollutant loads in the bay.

State board officials agree that it is difficult to quantify all of the improvements that would result from construction and operation of the Master Plan facilities. A regional board official told us that potentially harmful bacteria levels resulting from wastewater overflows return to safe levels for water contact about 4 days after the overflows occur. According to a regional board official, combined sewer overflows from 31 locations on the bayside will be reduced from the current average of 46 times a year to an average of 5 times a year. Also, days when swimming is prohibited are to be reduced from an average of 104 days a year to an average of 13 days a year. Even those overflows which are not collected for further treatment will have received sedimentation and skimming treatment in the storage/transport facilities.

According to city officials, the completed facilities will capture and treat all dry weather flows on the bayside at a secondary level before discharge into the bay. In addition, 50 percent of the bayside wet weather flow will be captured, treated, and discharged to the bay as primary and secondary effluent. Also, the transports are fitted with baffles at overflow points and will remove a significant amount of solids and floatables from wastewater that overflows.

City officials further stated that when the west side transport, the southwest ocean outfall, and the Richmond-Sunset Treatment plant are complete and working together, all west side dry weather flows will be treated at a primary level and discharged into the ocean. We were also told that over 50 percent of west side wet weather flows will be captured, given a modified primary treatment, and then discharged.

City reports contained little conclusive evidence of the effect of San Francisco's pollution on fish and marine organisms. According to a regional board official, studies have indicated that wastewater overflows pollute the water and affect marine life near overflow points, but the long-term effects on the bay and ocean have not been measured. In response, city officials told us that their monitoring system is now being expanded.

The regional board official acknowledged that the specific effects of the city's waste discharges on the ecology of the whole bay are undefined. This is because the bay receives a multitude of point and nonpoint pollutant discharges and other environmental perturbations and currently their combined effects cannot be separated into specific effects attributable to specific sources.

#### Consultant studies question ocean discharge and other benefits

San Francisco had two major studies made to review the Master Plan. These studies, completed in 1980, questioned the environmental benefits that would be achieved by San Francisco's Wastewater Treatment Program. One study noted that the program detailed in the Master Plan will not alleviate all of the adverse conditions on the beaches and shoreline areas of the city, but will provide environmental benefits. The study pointed out that:

- The city's adoption of any wastewater plan will not necessarily eliminate the public health, environmental, and aesthetic effects of inadequate treatment. Approximately 89 percent of the wastewater discharged to the bay comes from sources other than San Francisco. Other sources of pollution include urban runoff, agricultural operations, construction activities, vessel wastes, oil spills, and dredging.

- The Master Plan facilities will probably result in increasing the number of days when it is safe to take shellfish from the bay. However, since a number of overflows into the bay will still occur, there will be periods when certain bay shellfish will be jeopardized. Even with no sewage overflows, many shellfish beds may become unacceptable during the wet season due to runoff from the land.
  
- The size of marine areas now affected by altered and contaminated marine communities is not known, nor has a forecast been made of the size of areas that can be expected to be affected elsewhere when existing discharges are diverted. There is no objective way of evaluating whether existing or proposed changes are beneficial or harmful to marine plant and animal communities.
  
- Violations of the bathing water standard will be reduced. However, violation days will still occur because of planned overflows and contributions from other sources.
  
- Aesthetic conditions along the city's shoreline will improve somewhat; however, no plan will eliminate debris from the beaches.

In one of the studies, a professor of ecology and member of the State Water Resources Control Board advisory committee with significant experience regarding the effect of waste discharges on the San Francisco Bay, stated that ocean or bay discharge were of essentially equal merit, and the waste discharges into the bay did not justify the cost of the proposed ocean disposal project (the Master Plan). The professor stated that:

"Domestic and industrial wastes treated at the secondary level are and will continue to be discharged into San Francisco Bay by all the other communities around the bay. I recently have been involved in developing sophisticated methods to detect any ecological effects which could be caused by wastewater from outfalls proposed or under construction around much of San Francisco Bay. Large amounts of money are being spent to reduce the toxicity and biostimulation of secondary wastes. It is reasonable to suppose that such expenditures are justified and that the effects of secondary wastes are not yet an overriding concern in San Francisco Bay. The major goal of the current project is to alleviate the effects of storm water overflows resulting from discharges of little-treated or untreated waste into the bay. Although it may be emotionally satisfactory to remove some of the overflows with the proposed \$2.1 billion program, the effect of the

fairly large number of current overflows is apparently small. It appears to me that no proper study of current ecological damage from overflows, including effects on shellfish, was actually made prior to design of the plan. The limited studies made recently do not confirm the need for diversion of portions of storm overflows to the ocean rather than the bay."

Both studies recommended modifying the Master Plan because of its high cost compared to questionable benefits. Recommendations included (1) eliminating or reducing the size of the crosstown tunnel, (2) reducing the size of the ocean outfall, and (3) eliminating or reducing the size of the Southwest treatment plant. But, no action was taken at that time.

#### Core systems to solve major portion of water pollution problem

San Francisco's Clean Water Program Executive Director told us that the two-core systems would significantly eliminate over 90 percent of the city's water pollution problems on a volume flow basis, but not the mass emissions of the pollutants. The remaining portion is exclusively wet weather flows. The director said that with the addition of a crosstown tunnel and storage and transport projects for other areas of the city, the program would effectively eliminate the city's water pollution problems with over 95 percent of the total sewage treated and discharged 4.5 miles into the ocean. The director added that the city's concern is completion of the two-core systems, continued assessment of the results, and reevaluation of the remaining projects. However, the director also believed that it is necessary to construct the southern transports of the bayside core system which are presently unscheduled because of the uncertainty of federal funding.

#### Program reviews during 1982 and their effect

##### Panel of experts

During January 1982 a panel of experts reviewed the San Francisco Wastewater Facility Construction Program and recommended to the EPA Regional Administrator the activation of both the dry and wet weather facilities which were under construction. They stated, however, that operational experience should be gained before proceeding with additional components of the Master Plan. They also believed that "this first phase represents the best use of available resources and offers substantial improvement to water quality."

The panel recommended (1) the conversion of the North Point Treatment Plant, originally scheduled to be abandoned, to a wet weather facility, (2) the sizing down, on an interim basis, of the

Southwest Treatment Plant to treat wastewater to a primary level for the west side dry weather flow and replacing the existing deteriorated Richmond-Sunset Plant, (3) the possibility of reducing the outfall's diameter, depending on ultimate flow estimates, and (4) the possibility of a surface crosstown force main in view of economic considerations.

The state board agreed in February 1982, that a closer look at the interim activation of the system is needed.

#### EPA Inspector General

After a review of the situation, EPA's Inspector General also suggested in April 1982 that a reevaluation of the issues of cost effectiveness and alternative technologies would be very productive.

#### City plans

In response to the studies, city officials told us that they rescheduled the construction of the transports, the outfall, and the Southwest Treatment Plant to occur in phases. This was done so that changes could be made later if it was determined after future evaluations that a specific project was not needed. They stated that they would follow the Master Plan concepts but decided not to modify the Master Plan. However, they acknowledged that the plan may be adjusted after future analysis.

City officials said that they would use the existing North Point Treatment Plant during wet weather. Also, they told us that they would use the oceanside transport and outfall with the old existing Richmond-Sunset Treatment Plant, which would be renovated to handle 90 percent of the oceanside's pollution. In addition, city officials stated that construction of a Southwest Treatment Plant would be deferred or built on a smaller scale, depending on further studies.

The city, in addition, has applied for and is revising its waiver application to EPA to allow it to discharge wastewater with primary treatment only into the ocean. A city official believes that an ocean discharge could lessen San Francisco's operating and maintenance costs about \$10 million a year by eliminating its secondary treatment process. However, unless a significant amount of solids are removed from the wastewater before an ocean discharge, there may be adverse environmental effects. Currently, according to a city official, 55 to 60 percent of the solids can be removed, but state and federal removal requirements are 75 and 85 percent, respectively.

#### Cost savings by city

The city's Chief Administrative Officer informed us that San Francisco has made and will continue to make cost-effective

program design changes to effectuate cost savings which the officer stated would be up to \$1.1 billion as summarized below:

Design Changes Made by the City  
Resulting in Substantial Savings

	<u>Estimated savings</u>
	(in millions)
Modifications to ocean outfall	\$ 100
Proposed construction of crosstown pipelines instead of a deep tunnel	200
Continued operation of North Point Treatment Plant during wet weather	500
Treatment of west side flows to primary level only	170
Use of west side transport for quasi-primary treatment	<u>100</u>
Total	<u>\$1,070</u>

The officer also stated that, even with these changes, the city will achieve equal or greater levels of environmental benefits.

DESIGN REVIEWS AND CHANGE ORDER  
REVIEWS HAVE BEEN LIMITED

Only limited design and change order reviews have been made by EPA and the state board because of limited resources.

Limited design reviews

Neither the city nor the state board analyzed structural, mechanical, or electrical project elements during design reviews. City officials said that to alleviate a high rate of unemployment in the construction trades, the city and state agreed to escalate the design phase and begin construction rapidly. They said that this accelerated construction program gave them insufficient time to consider the detailed elements in their design review. However, a state board official said there was adequate time for detailed design reviews as agreed to by the city, which is the grantee's responsibility.

State board officials recognized that the review they perform is limited because it omits mechanical, electrical, and

structural items. In February 1981, the state board suggested to EPA alternative levels of design review, from minimal to extensive, citing the following benefits:

- reduction of contract change orders,
- savings in cost of construction,
- reduction of operational problems, and
- reduced violations of wastewater discharge requirements.

According to a state board official, no changes to the design review process were made because of limited resources, potential liability, and delays. The state board further believed that under California law accountability and liability for project design rests with the design engineer. A decision was made by the state board to do design reviews for eligibility and wastewater treatment capabilities only.

An EPA official told us that it was not the intent of the Clean Water Act or related regulations that the state or EPA make detailed design reviews, and that the state board has neither the expertise nor the resources to do them. The official believed the city is responsible to make these reviews and has the staff to do them. Although acknowledging the potential benefits of such reviews, the official said that EPA and the state had limited resources and that the cost in reductions to other programs would outweigh these benefits. Concerning the need for more review, the official stated that the state board initiated a review of the suitability of bidding and constructing projects, which are to be made by the Corps of Engineers.

The Corps, when making its construction inspections, observed design-associated problems during site visits; but it did not report them because Corps' officials believed such disclosures are beyond the scope of their agreement with EPA. Corps officials assured us that they would, however, disclose deficiencies they note which related to potential safety, operational, or maintenance problems. City officials stated that certain safety problems noted by the Corps are in process of being corrected.

An EPA official stated that coordination problems between the Corps, EPA, and the state have occurred in the past. The official further stated that EPA is developing a policy to clarify the city's responsibility for design, construction, and operation of wastewater treatment facilities.

Limited change order reviews

We found that change orders were approved without considering all relevant information. All pertinent facts were not included in the city's explanations of the need for changes and requests for federal funding. City officials told us that it is in their best interest to have change orders approved, so they develop justifications which result in favorable decisions.

We discussed with a state board official the approval of a change order based solely on the information in the city's request for redetermination. The state board initially determined that an \$18,000 change order to pay for a right-of-way was not eligible for grant funding, since EPA guidance states that this cost is the city's responsibility. The city, however, requested a reversal of this decision, citing a federal regulation which it interpreted to make right-of-way costs grant eligible. The state board could not locate information in its files pertinent to the original decision and reversed itself. However, it continued to find right-of-way costs ineligible in other cases. The responsible state board official could not explain why the initial determination had been reversed.

In another example, the Corps approved a change order to relocate electrical equipment previously installed. The city justified the relocation based on unforeseen site conditions, which is an appropriate basis for approving a change order. A review of the city's files, however, would have revealed documentation showing that the contractor had not originally installed the electrical equipment according to plans and specifications. Such a change--due to improper construction--is not eligible for funding.

According to EPA and state board officials, reduced resources limit the amount of additional material which can be reviewed in a timely manner. They said that with limited resources the state is not able to make an extensive review of every change order and, therefore, must rely on the city to provide the necessary supporting information. They mentioned that even though the costs are subject to a final audit, this is a somewhat limited guarantee.

Corps officials told us that they now have access to and currently review the city's files and supporting documents on occasion and when they deem necessary.

CONSULTANT SELECTION PROCESS NEEDS MORE CONTROL

Once a firm has been awarded a contract, EPA's regulations permit the city to grant it additional contracts or modify its original contract without going through another contractor selection process. Since work began on San Francisco's Wastewater Program in 1977, the city awarded \$60 million in contracts to seven

consulting firms for design and construction management and modified their contracts to add \$26.5 million more. Altogether, these seven contractors received about 81 percent of all design and management funds. It should be noted that the 1981 amendments to the Clean Water Act now restrict these types of expenditures by providing for an allowance for the non-federal funds expended during the facility planning and advanced engineering and design phase after a proposed project receives an EPA grant.

Uniform evaluations were not done by the city when consultants were selected for design and construction management. Inconsistent scoring systems were often used to rate the same proposal because the city had no guidelines for such evaluations. The state board made limited reviews of the city's evaluation process, and EPA reviews of the state board's monitoring system were insufficient to determine its effectiveness.

#### Evaluators used different selection criteria

The city is required to evaluate proposals uniformly and objectively. Our review, however, showed that its evaluators used different techniques in analyzing 7 of the 14 consultant selections in 1976, although EPA's procurement regulations had just been established at that time. For example, evaluators used inconsistent scoring systems to rate the same proposal.

According to a state board official, program regulations only require a summary of the selection process to be included with contracts submitted for procedural approval. The regulations do not require that accurate and complete records of the entire procurement process be kept. The state board spot checks these contracts and summaries and reviews them where a problem is suspected during the final audit.

An EPA official confirmed that the city had inconsistent procedures for consultant selection in the early stages of the wastewater program. The official stated that in late 1978 the city developed procedures for its project managers and that the city's construction management firm also issued guidelines for consultant selection. The official said that the selection process has been continually improving since 1978.

#### Limited review of consultant selection process

EPA, in a June 1976 agreement, delegated the monitoring of the city's consultant selection process to the state board. EPA approved a state-designed checklist requiring summaries of the three top ranked proposals, but it did not require the submission of the supporting documents used in evaluating these proposals. Further, EPA's review of the state board's monitoring system was inadequate.

State board officials recognized the limitations of their review, but said that EPA approved their monitoring procedures and the board did not have the resources to handle a more extensive review, if it were required. State board officials believed that their procedures complied with EPA regulations. Both state and EPA officials acknowledged that more extensive reviews would have prevented some of the city's selection problems. They stated, however, that limited resources and concerns with delays due to lengthy reviews prevented such examinations. In addition, we were told that new EPA regulations governing consultant selection decrease oversight and allow grantee self-certification which will result in less EPA and state review.

It is important to identify and rectify selection problems before awarding contracts to ensure that the best qualified firm is selected. We were told that while the state board had not been required to review details such as individual evaluator scores and interview information, it does so now.

Also, EPA's subsequent reviews of the state board's limited monitoring did not determine whether the board's system was working effectively. Its review was limited to only verifying that the state board was properly completing a checklist with only spotchecks of the actual documents submitted by the city. Further, EPA did not review a sufficient number of contract awards and perform such reviews as often as required by its guidelines. An EPA official stated that the frequency of these reviews decreased because of limited EPA resources.

#### AGENCY COMMENTS AND OUR EVALUATION

##### EPA headquarters

EPA's Associate Administrator for Policy and Resource Management shares our concern of achieving water quality objectives in a cost-effective manner. The administrator said that earlier reviews (including a recent one by a panel of experts) and resulting modifications demonstrate the responsiveness of the Master Plan to changing technologies and reduced funding. The administrator mentioned that a reexamination of the program is scheduled following completion of the two-core system in 1986, as we now recommend.

Funding levels, according to the Associate Administrator, have been significantly reduced to less than \$100 million to achieve operable core facilities. The administrator said that water quality costs and benefits will be studied before proceeding further. Also, the administrator stated that operational data obtained in the next 5 years will be used to reevaluate the costs and benefits of completing the entire Master Plan and that such evaluation will be required before making major fund allocations. Accordingly, the administrator said EPA and the state agree that

there is no need to limit further funding for the basic project. In our view, new aspects of the program should only be undertaken if analyses show these remaining projects to be cost effective for the benefits to be obtained.

As for the crosstown tunnel, ocean outfall and Southwest Treatment Plant, the Associate Administrator stated that the city plans to make a cost-effectiveness analysis of the crosstown facilities when the two-core system is fully operational in 1986. With respect to the outfall, the Associate Administrator stated that construction is proceeding and that significant cost savings are not achievable by downsizing. Also, the administrator said construction of the Southwest Treatment Plant has been rescheduled to coincide with the reevaluation of alternatives to the Master Plan. We agree with the necessity of these reviews; however, we continue to emphasize that no additional work beyond the initial systems currently under construction should be undertaken until these reviews fully justify program additions.

In response to the need for more detailed project reviews, the Associate Administrator stated that EPA and the state have instituted reviews of the suitability of bidding and construction which are to be made by the Corps. The administrator said, however, that it was not the intent of the Congress that EPA or the states perform extensive reviews of project designs or change orders. The administrator said these reviews are the responsibility of the grantees and their consultants. Further, the administrator stated that modifications to existing agreements are not appropriate since they have either been implemented or would require actions beyond the scope of EPA's and/or the state's role, which is to ensure that the city is responsible and complies with appropriate laws and regulations, rather than reviewing individual projects. We believe, however, that periodic reviews of individual projects are necessary if EPA is to assure satisfactory compliance by the city. We further believe such periodic testing is not now done by EPA or the state because of limited resources.

As to the need for more control over the consultant selection process, the Associate Administrator stated that many of the large grants were awarded before 1974. The administrator said that EPA's regulations, which became effective in 1976, require documentation of the procurement process and that the city has also developed procedures to regulate and improve its process which will be applicable to future grants. Our review, however, noted that the contract awards were made at the time the new regulations were established.

#### State board

The Chairwoman of the State Water Resources Control Board informed us that the board believes its current level of involvement with San Francisco's Wastewater Program is appropriate and

that the intent of federal legislation is to shift major areas of responsibility to the grantee. She stated that numerous alternative plans have been considered and that the board continues to support making analyses of alternatives to determine the validity of the Master Plan as the most cost-effective means of meeting the state/federal discharge requirements. The board, she stated, agreed that funding availability may delay full implementation of the Master Plan. She said efforts have been focused on optimizing the capabilities of facilities already constructed or under construction. She further stated that modifications have been incorporated to obtain improvements from facilities which will need to be operated over an extended period until the next stage of the Master Plan is completed.

The Chairwoman stated that the project engineer is responsible for project design and that if the board reviewed designs it would duplicate the engineers efforts and assume liability for design elements. The board believes its role of reviewing designs for consistency with approved plans, evaluation of cost effectiveness, and determination of eligibility are proper and should not be expanded. With regard to change orders, she stated that sufficient resources are not available to make detailed reviews in all cases. Concerning the consultant selection and monitoring processes, she stated that the state board does not have the resources to make detailed procurement reviews and questioned whether these reviews would be cost effective because the city is ultimately responsible for the performance of consultants selected. We continue to believe, however, that because of the high cost of this project and its importance to the city periodic design reviews should be made by the state board to ensure the project is being effectively managed.

#### Regional board

The Executive Director of California's Regional Water Quality Control Board agreed with the need for reevaluation of certain remaining Master Plan projects. However, the director believes that funding for additional work should be provided for certain projects without further study. For example, the West Side Pump Station and Richmond-Sunset Plant improvements, the director said, are needed now to enable the proposed minimum west side core system to operate when the ocean outfall and west side transport are completed in late 1985.

The Executive Director further believes that a monitoring program should be initiated to determine water quality impacts and whether the Southwest Plant should be built as designed, modified, or not built at all. The director also believes that additional facilities beyond the two-core system will be required to collect, store, treat, and dispose of the excess flows in the southeast bayside area to correct very serious water quality problems existing there. The director stated that this area contains

significant shellfish resources and is a major water oriented recreation area and believes these facilities should be funded and built as soon as possible. We concur in this approach.

#### City of San Francisco

The city's Chief Administrative Officer stated that San Francisco has made and will continue to make cost-effective program design changes to realize cost savings of up to \$1.1 billion. The officer stated that elements of the Master Plan are being continually evaluated through the planning, design, and construction phases and that refinements are approved by the regulatory agencies. In addition, the officer believed that this process allows the city to respond to new laws, new funding schedules, and new technology in the most cost-effective manner. The officer stated that 2 years ago, the federal and state governments were so adamant that the Master Plan be built, that they attempted to get San Francisco to sign a consent decree. This, the officer said, would have obligated the city to construct all of the Master Plan even if federal funds were not made available.

Although, recognizing that when the two-core system is completed over 90 percent of the city's wastewater would be intercepted and treated, the officer stated the city still needs wet weather facilities, as required by the Master Plan, for proper treatment and discharge of wet weather sewage.

Concerning the consultant selection process, the officer stated that the Clean Water Program adopted more comprehensive consultant procurement procedures in February 1982. The officer stated that the city is willing to work with the state board and EPA to improve their reviews over the consultant selection process.

#### CONCLUSIONS

Reduced funding of San Francisco's Wastewater Program has resulted in construction lagging behind planned levels and will make it difficult for the city to complete its existing program within the foreseeable future. The city may not be able to afford such a costly undertaking, if funds from other sources are not forthcoming. In our view, the outcome will not only result in construction delays, but also the inability to fully achieve established water quality goals. Because of limited funding, the program should be reexamined to determine whether a more cost-effective system can be built.

After the core systems are complete, we question whether an additional \$2 billion should be spent to attain uncertain additional water quality benefits. We believe the required wastewater treatment level for ocean discharge should be reviewed and resolved before investing in additional projects after the ocean

and bayside core systems are completed. Limited resources should be directed where they will achieve the most benefits, such as in the southeast bayside area, to correct existing water quality problems.

Also, the program needs better management. Project design and change order reviews have been limited because of reduced resources. In addition, deficiencies that the Corps found in its inspections were not disclosed. These limitations do not ensure that the city's projects are effectively managed, while at the same time, adequately protecting federal interests. These limited reviews only reinforce the need for the state board to at least make periodic assessments.

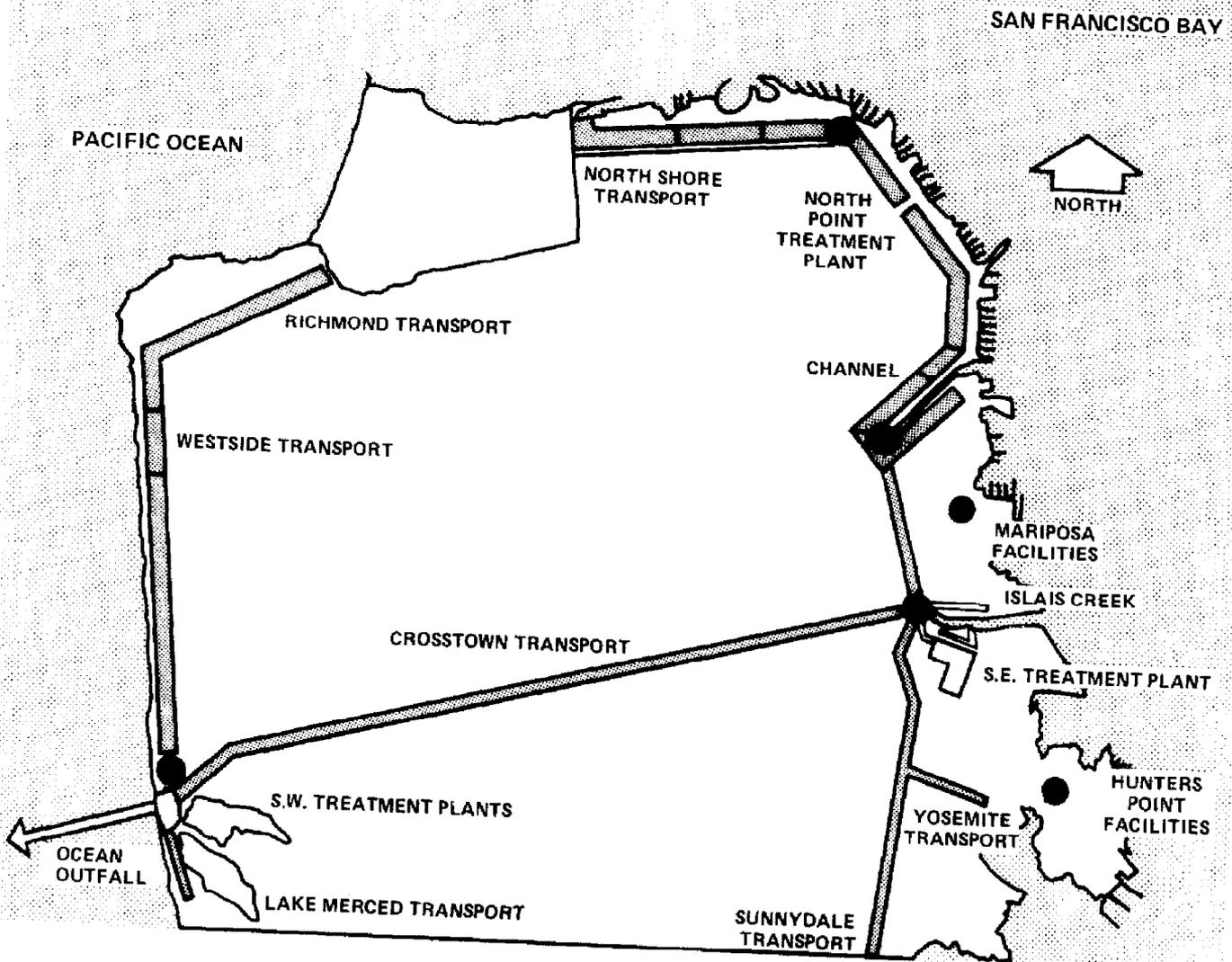
The city's consultant selection process needs better control and surveillance. Its selection procedures did not ensure that the best qualified firms were chosen although we have been told that improvements have been implemented. The state board's review of the city's procurement practices was too limited to determine if the city's consultant selections were appropriate because the state board relied on the city's evaluation summaries. In addition, EPA's review of the state board's monitoring was too limited to determine if the process was working effectively.

#### RECOMMENDATIONS

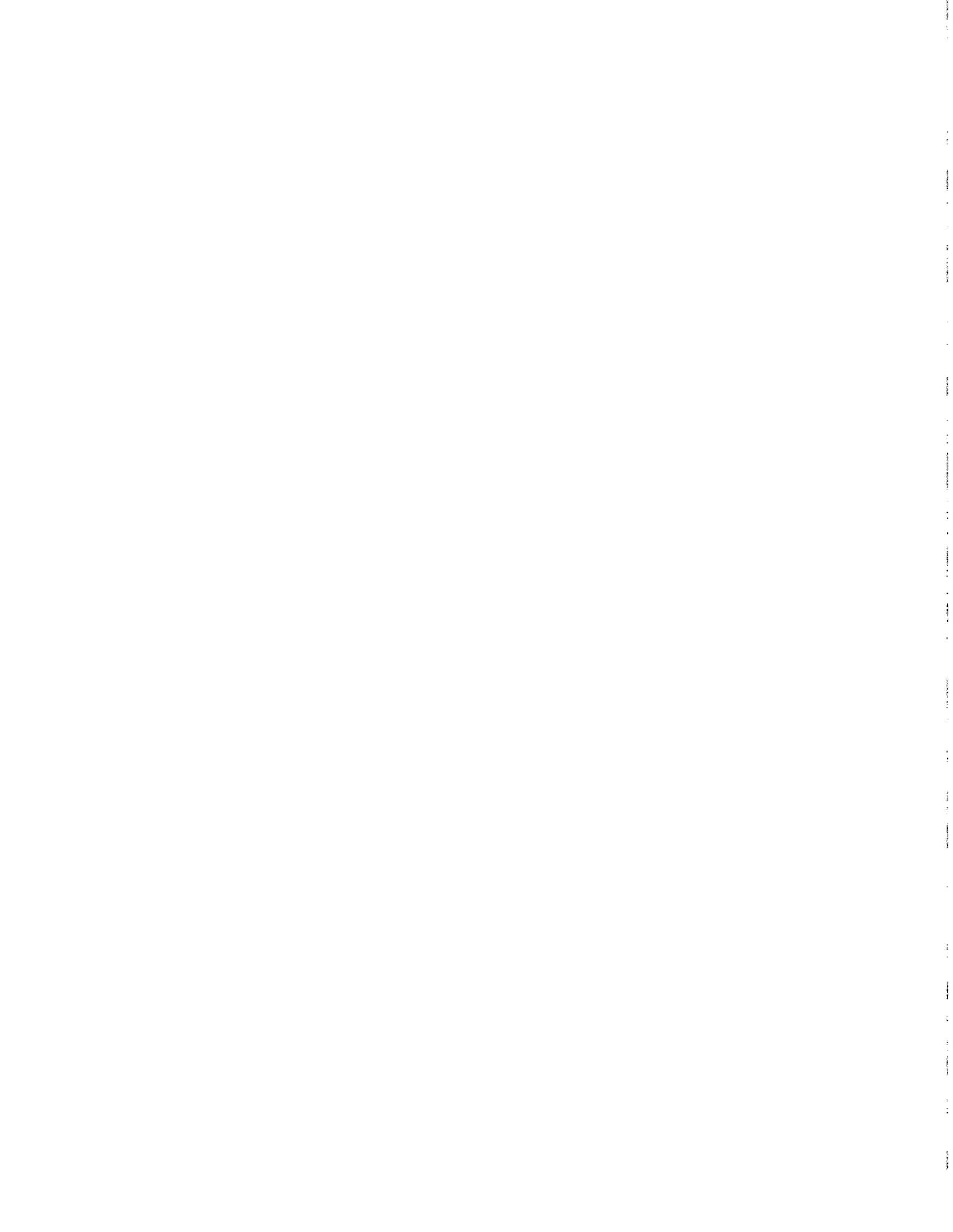
To ensure that San Francisco's Wastewater Program benefits are achievable, we recommend that the Administrator, Environmental Protection Agency, suggest to the state board that it fund limited additional work until the initial systems under construction are completed and until the city analyzes the costs and benefits of the remaining projects. The limited work should focus on the remaining areas with very serious water quality problems such as the southeast bayside. The analysis should compare the (1) benefits of a crosstown tunnel to a pressurized pipe or the continuance of discharging wastewater into the bay, (2) current costs of planned expansion of the crosstown tunnel and the Southwest Plant for wet weather flows to their incremental benefits, and (3) costs of planned bayside and oceanside storage and transport projects to their incremental benefits.

To improve surveillance and control over project design and change orders, we recommend that the Administrator, Environmental Protection Agency, amend the EPA agreements with the California State Board and the Corps to require (1) the state board to make periodic design reviews which include structural, electrical, and mechanical elements and (2) the Corps to promptly disclose to the city deficiencies it identifies during inspections.

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